

# Gravity in Korean Phonology\*

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The term "gravity" in the title does not mean 'terrestrial gravitation' but rather a centrifugal force in the oral cavity. It is borrowed from Jakobsonian distinctive feature theory where the feature [grave] refers to phonetic quality that is best manifested in labial and velar consonants, i.e., those sounds that are made in the peripheral area of the vocal tract. The title then means 'articulatory predilection for peripherality' or tendency to articulate sounds in labial or velar regions in Korean phonology.

In Kim (1971), I regarded the deletion of a consonant in the case of three-consonant abutting, e.g., *eps-ta* [əpta], 'there is not', *neks-to* [nekto] 'the spirit also', *celm-ta* [cəmta] 'be young', etc., as being governed by what I called the principle of close articulation; that is, of two base-final consonants, the one with narrower aperture remains and the one with wider aperture deletes. Then I added the following remark:

"From another point of view, one may say that what governs the consonant deletion in this case is the place of articulation in terms of *peripheral* against *central* sounds (i.e., peripheral sounds like *p*, *k*, *m* survive, while central sounds like *s*, *l*, get deleted). This distinction of peripheral vs. central sounds in Korean also appears in one type of tensification (e.g., *il-pun* [ilbun] 'one minute', *il-to* [iltto] 'one degree', *il-cang* [ilccap] 'chapter one', *il-kwa* [ilgwa] 'lesson one'). It is tempting to speculate that the two phenomena are functionally related, but what the exact role, if any, of such distinction of central/peripheral sounds in Korean is, and what the phonetic explanation underlying such distinction is remains as one of the problems in Korean phonology." (p.90)

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This paper is an attempt to solve this problem at least partially.

I have already mentioned two phenomena in Korean phonology, cluster simplification and tensification, that show the need for distinction between peripheral and central sounds. Below, I will cite several more cases where the peripheral/central distinction seems to be functional. Then I will examine possible phonetic explanations for it and its implications in Korean phonology.

(1) In consonantal assimilation in the place of articulation, central sounds assimilate to peripheral consonants, but the reverse direction does not occur in Korean. Thus, *s*, *n*, *c*, *t* become *p* or *m* before a labial consonant, but *k* or *ŋ* before a velar consonant. On the other hand, assimilation in the opposite direction never takes place. For example,

<i>sinpal</i> → <i>simpal</i> 'shoes'	<i>ket-ki</i> → <i>kekki</i> 'walking'
<i>cwun-pi</i> → <i>cwumpi</i> 'preparation'	<i>cenki</i> → <i>ceŋki</i> 'electricity'
<i>sinmun</i> → <i>simmun</i> 'newspaper'	<i>cec-kasum</i> → <i>cekkasum</i> 'breast'
<i>non-mun</i> → <i>nommun</i> 'thesis'	<i>os-kolum</i> → <i>okkolum</i> 'ribbon'
<i>kkoch-path</i> → <i>kkoppath</i> 'flower garden'	

but

<i>aph-ni</i> →* <i>anni</i> 'front teeth'	<i>kak-ca</i> →* <i>katca</i> 'each person'
<i>sinnan</i> →* <i>sinnan</i> 'worry'	<i>maktayki</i> →* <i>mattayki</i> 'a stick'
<i>sip-tay</i> →* <i>sittay</i> 'teens'	<i>toknip</i> →* <i>tonnip</i> 'independence'
<i>sipcaka</i> →* <i>siccaka</i> 'cross'	<i>kang-nalwu</i> →* <i>kannalwu</i> 'ford'

(Cf. English *enclose*, *unprepared*, *cat-call*, *bat-man* where *n* or *t* does not assimilate to the following peripheral consonant, while in *length* [leŋθ], [p] may be dentalized to give [lenθ].)

(2) Another kind of assimilation in which the peripheral vs. central distinction seems to play a role is umlaut by which vowels [a, o, u, ə] become [æ, ø, ü, e] respectively due to the following high front vowel *i*, e.g., *ai*[æ] 'child', *sei* [se] 'three', *poita* [pøta] 'show, be seen', *nuita* [nüta] 'lay', etc. What should be noted in this case is that umlaut also takes place when there is an intervening consonant between the two vowels, but that this optional intervening consonant must be a peripheral one.

For example,

<i>aki</i> [æ ki] 'infant'	<i>api</i> [æ bi] 'father'
<i>cipangi</i> [cipæŋi] 'walking stick'	<i>mækita</i> [megida] 'feed'
<i>əmi</i> [emi] 'mother'	<i>sokita</i> [søgida] 'deceive'

nophita [nɒphida] 'elevate'

cukita [cügida] 'kill'

nupita [nübida] 'embroider'

but

kasi \*[kæ si] 'thorn'

kaci \*[kæ ji] 'branch'

æti \*[edi] 'where'

əmæni \*[əmeni] 'mother'

soʎi \*[sɒri] 'sound'

kuti \*[küji] 'insistently'

soypuchi \*[sɒbüchi] 'metal'

There seems to be no universal phonetic reason why central consonants should prevent umlaut from taking place, for we find in German such examples as *Mann-Männer*, *Gott-Götter*, *muss-müssen*, etc.

What then is the relation between umlaut and centrifugality in Korean? There is a problem in that even when one grants that the distinction between central vs. peripheral consonants is needed in writing the umlaut rule in Korean phonology, it is not at all obvious that it is directly related to the tendency toward peripheral articulation, for, unlike assimilation in the place of articulation, there is nothing in umlaut that shows that some central sounds change to peripheral sounds by that process. Furthermore, umlaut refers to the sound change by which back vowels become front vowels. And back vowels are, like [k, g, ŋ], velar sounds, while front vowels are, like [ɕ, tɕ, dʒ], palatal sounds. From this point of view, vowel fronting in umlaut is centralization rather than peripheralization, and this is a centripetal process, not a centrifugal process.

This is, however, not a counterexample, but merely an exception to centrifugality in Korean. In Kim(1971 : 94), I have argued that examples like *tat-soli*→[tassori] 'consonants' *ket-sap-ko*→[kæssapko] 'walk and', *pu-pu*→[puβu] 'acouple', *aka*→[aʔa] 'baby', etc., which show that stops are spirantized, are not counterexamples invalidating the principle of close articulation in Korean, but merely exceptional examples that show that language-specific phonological processes are overruled by universal phonological forces (in this case, spirantization before another fricative or intervocalically). Umlaut is another such example. Umlaut is a process by which back vowels are fronted by the following high-front vowel *i*, and it is only natural that this powerful process takes place in Korean despite a counterdirectional centrifugal force. Therefore, the question one must ask is *not* why umlaut, a form of centralizing process, takes place in Korean, but why It does *not* take place when an optional intervening consonant is a central consonant. It is only in this context that one can see the relation between umlaut and centrifugality. That is, umlaut

is prevented just in case the intervening consonant is a central one, for otherwise, it will create too much centrality. In other words, umlaut is allowed to take place when the intervening consonant is a peripheral one, for it can 'neutralize', so to speak, the centralization by umlaut, but it is disallowed otherwise. It is in this sense that I think that umlaut and centrifugality are functionally related.

(3) In Korean, peripheral consonants are much more frequently used than central consonants as syllable-final sounds. That is, *k* and *p* occur as syllable-final consonants with greater frequency than *t* and *c*. One can almost count the number of monosyllabic words that end in *t* or *c*. It is true that the same cannot be said about aspirated and tense consonants, i.e., *kh*, *ph*, *kk*, *pp* do not necessarily occur more often than *th*, *ch*, *tt*, *cc*, etc. But this is understandable and expected, for in word-final and syllable-final positions, there is a neutralization of aspiration and tenseness. Why then do *k* and *p* have such a greater frequency of occurrence as syllable-final consonants than *t* and *c*? I'd like to think that a centrifugal force in Korean phonology is responsible for it.

(4) Korean developed closed syllables from open syllables, probably under the influence of the principle of close articulation. Given a word ending in an open syllable, there are of course two ways to make it end in a closed syllable: one is to delete the final vowel, i. e., CVCV→CVC, and the other is to add a consonant at the end, i.e., CV→CVC. Both types are found in Korean. The former is found in such examples as *sem* 'island' cf. Old Japanese (OJ.) *simā*; *path* 'field' OJ. *pata*; *kom* 'bear' cf. OJ. *kuma*, etc. And the latter is found in the following alternations: *pota*~*potam* 'than'; *puthe*~*puthem* 'from'; *mota*~*mongttang* 'all'; *kkaci*~*kkeceng* 'to, till'; *ay*~*ak* or *ang* as in *karay*~*karak* 'a piece of string, stick', *koray*~*korang* 'burrow', *anay*~*anak* 'wife'; *ey*~*ek* or *eng* as in *ttukkey*~*ttukkeng* 'cover, lid' *cey*~*cek* 'time', *chey*~*chek* 'pretense', etc. What should be noticed in all of above examples is that the additive consonant that makes the syllable closed is one of peripheral ones, i.e., *m*, *ng*, or *k*. I like to think it is a non-accidental fact that the additive consonant in Korean was restricted to peripheral sounds.

(5) A somewhat similar phenomenon is found in the way Korean avoided hiatus. In general, there are three ways to remedy hiatus. One is via contraction (e.g., *ai*→*e*, *au*→*o*), the second via deletion (e.g., *ai*→*a* or *i*, *au*→*a* or *u*), and the last via epenthesis of a consonant (e.g., *ai*→*ayi*, *au*→*awu*). Korean chose the last method, and furthermore, it chose [ŋ] as the epenthetic consonant (cf. Lee 1955b). For example,

nwun-maol→nwun-mangwul 'eyeball'

peweri→pengeri 'a mute'

cohi→coi→congi 'paper'

so-aci→songaci 'calf'

pu-e→pung-e 'carp'

As Lee (1955 : 487) remarks, glides are most frequently used as epenthetic consonants in many languages, and [ɲ] is very unique to Korean. Why then [ɲ]? Again, I think it's the centrifugal force that gave rise to [ɲ] as the epenthetic consonant in Korean. Let's say first of all that in epenthesis there is a constraint that requires an epenthetic consonant to be a sonorant, i.e., one of glides, liquids, or nasals, but not obstruents. Suppose now that on this constraint one superimposes centrifugality. Since there are neither peripheral glides nor peripheral liquids, a peripheral nasal [ɲ] would be a natural choice for epenthesis! (Given a plausible assumption that an epenthetic consonant should be as tolerable and obscure as possible, [ɲ] is a more logical choice than the other peripheral nasal [m], for the former is certainly less conspicuous and carries a less functional load in Korean than the latter.)

(6) Palatalization in Korean is unidirectional in that only alveolars are palatalized, but not velars. Thus,

kath -i [kachi] 'together'

mat-i [maji] 'the eldest'

but

puekh-i \*[puechi] 'kitchen is'

mak-i \*[maji] 'a stopper'

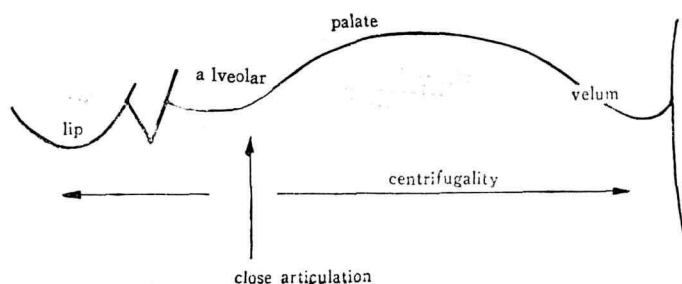
Palatalization of alveolars in front of *i* or *y* is quite general in Korean, but palatalization of velars (cf. English *music-musician*, *phonetic-phonetician*, *pedagogue-pedagogic*, etc. as well as *act-action*, *divide-division*, *tense-tension*, etc.) is non-existent in Korean. To be sure, there are examples like *kil-cil* 'road' *him-sim* 'force', *hye-se* 'tongue', but these are quite isolated items, and at best represent a non-standard dialectal pronunciation. What's striking is that there is some evidence from historical Korean phonology that a natural tendency to palatalize velars was counteracted by a strange force, and that some lexical items that did palatalize were later depalatalized back to velars, taking along in that process some palatals which originally were not velars; that is, some original palatals were velarized when palatalized velars were depalatalized. (See Hong 1966 : 138 for some examples like *cel-tan*→*kyel-tan* 'failure'. Apparently, the same process changed some palatalized alveolars to velars, e.g., *timchi*→*cimchi*→*kimchi* 'pickled cabbage'.) One would be hard-pressed to explain this superficially aberrant behavior of palatalization in Korean without taking into consideration

of a centrifugal force interacting with a natural force of palatalization.

So far, I have given several phonological phenomena in Korean that show directionality toward peripheral regions of the vocal tract, which I have termed centrifugality. How should one then explain this centrifugal force in Korean? What is its phonetic reason? The answer to this question can only be vested, at least for the present, in conjecture and speculation. I would like to offer the following hypothesis:

CENTRIFUGALITY IN KOREAN IS IN COMPLEMENTARY RELATIONSHIP WITH THE PRINCIPLE OF CLOSE ARTICULATION. While the latter's movement is vertical toward the upper articulator, the former's is horizontal toward the peripheral regions of the vocal tract, and, furthermore, its direction is a consequence of the former.

The following observation by Lindblom (1972) is quite instructive in understanding the complementary relationship between the two directions in Korean phonology. Examining in detail the degree of jaw opening, an index of articulatory aperture, as a function of the distance between two incisors, Lindblom has found that, with the neutral position of the tongue and the lips, a wide opening of the jaw (when the inter-incisary distance is about 23-25mm) produces the vowel [a], and that the first contact between the upper articulator and the lower articulator occurs when the jaw opening is narrowed to about 5mm, and furthermore, that the first contact is made either at the lips or between the tongue tip and the apico-alveola. What this means is that, as one closes one's mouth for a consonantal articulation, labials and the dentals would be the first to be produced (Its implication in universal first child vocabulary of the form [mama], [dada], [papa], [nana], etc. is quite clear.) This finding becomes more interesting when one considers it in conjunction with the principle of close articulation in Korean which changes such syllable-final sounds as *s*, *c*, *l*, *h* to *t* or *n*. What is particularly to be noted is that, as the jaw-opening is progressively narrowed by the principle of close articulation, one part in the vocal tract that would be first obstructed is the apico-alveola region, and therefore that areas where there is still enough space for tongue articulation are peripheral regions in the tract. That is, one may speculate that centrifugality in Korean is due to the fact that, as the close articulation clogs up the central area of the vocal tract, articulation had to move toward the periphery. This can be crudely likened to a damming in the center of an oblong lake. Because of the dam, the water must now move toward the edges of the lake. The two directions can be diagrammed as follows:



It is in this sense that centrifugality and the principle of close articulation in Korean have a complementary and horizontal-vertical relationship to each other.

Linguistic systems strive toward a state of equilibrium. Therefore, a change that breaks a balanced state of the system often entails another change which is complementary or compensatory in nature. The so-called 'compensatory lengthening' is an example. That Korean developed a new series of front vowels (*uy*, *ey*, *ay*) through monophthongization of diphthongs after the vowel shift during the 12th and 13th centuries emptied the space for front vowels (cf. Lee 1955a) is another such example. Space for articulation is an important concept in phonetics and phonology. One sees it in operation in the lowering of nasalized vowels in French (for example, compare the vowels in the following pairs: *fine* [fin] 'fine' (fem.) vs. *fin* [fɛ̃]; *senne* [sɛn] 'seine' vs. *sens* [sɑ̃s] 'sense'; *une* [yn] 'a' (fem.) vs. *un* [œ̃] 'a' (masc.), etc.). The vowel lowering can be explained in terms of articulatory space; i.e., for nasalization, the velum must be lowered to occupy the space normally reserved for high vowel articulation, thus pushing the tongue body further down. Likewise, it is because of articulatory space that in Middle Korean the backing of *e* to [ə] caused a chain reaction of vowel shift (for Middle Korean vowel shift, see Kim 1963 and Lee 1969).

Centrifugality in Korean then is a movement of the articulators toward the space yet unclogged by close articulation. The former therefore is compensatory and complementary to the latter. Extremization of centrifugality in some future will probably germinate its own compensatory, i.e., centripetal, force. But for the moment, it appears that close articulation and centrifugality are two underlying currents in Korean phonology.

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